



NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
400 MARYLAND AVENUE, SW, WASHINGTON 25, D.C.
TELEPHONES: WORTH 2-4155 — WORTH 3-1110

FOR RELEASE: ON DELIVERY
8:15 P.M.
Monday, April 1, 1963

612

Address
by
James E. Webb, Administrator
National Aeronautics and Space Administration

Annual Meeting
DEPARTMENT OF ELEMENTARY SCHOOL PRINCIPALS
National Education Association
Oklahoma City, Oklahoma
April 1, 1963

* * *

The opportunity to meet in Oklahoma City with a group of men and women who are concerned with the education of young people is one which I appreciate. During many years in Oklahoma, it was my privilege to participate in the organization of the Frontiers of Science Foundation -- a group which was deeply concerned with stimulating a greater interest in science on the part of the youth of this state.

This continues to be a problem, not only for Oklahoma, but for the nation, for the extent to which you and your associates can stimulate and develop an appreciation of science and technology among the students now in your schools will largely determine the availability of gifted scientific and technological manpower to meet our nation's needs in the future years.

The critical importance of meeting these needs is best illustrated, perhaps, by an examination of the explosive growth of scientific research and technological development in the United States, as evidenced by federal expenditures for this purpose.

The first federal investment in scientific research was the appropriation of \$2,500 by a reluctant Congress to finance the Lewis and Clark expedition in 1803. By 1900, federal research and development expenditures were still under \$10 million a year, and as recently as 1940, just prior to World War II, they had not yet reached \$100 million a year. That sum would finance the activities of the National Aeronautics and Space Administration for about 10 days, under the budget authorized for the current fiscal year.

With World War II, government-sponsored science and technology really came of age. By 1945, federal expenditures for research and development had risen to \$1 billion a year, and by 1953 to \$3 billion annually. Since 1955, the federal investment in this form of activity has grown five-fold -- from slightly over \$3 billion a year to almost \$15 billion included in President Kennedy's budget request for Fiscal Year 1964. In addition, industry will expend about \$5 billion for the same purpose.

Obviously, these expenditures are drastically increasing our national requirement for creative scientists and engineers, particularly those with advanced degrees -- people whose choice of career will be profoundly influenced by the knowledge and inspiration which they receive at your hands.

Before dealing specifically with NASA efforts to assist educators, let us consider for a moment the space program now underway. Four major considerations have made it clear that an understanding of the space environment, and the development of the technology which will enable us to operate freely in space, are imperative.

First, the modern rocket engine, which can operate in the vacuum of space by carrying its own supply of oxygen, has given us and other nations for the first time the means to explore and

utilize the space medium. Given this ability, and the spectacular achievements already made, Americans and citizens of other nations assuredly will not remain confined to this small planet. We and they will explore space, and will learn to use it. Knowing this, we can settle for nothing less than a position at the forefront of that pioneering effort.

Second, it is generally recognized that our national security itself is heavily involved in the space competition. Not only our prestige, but our capacity for constructive international leadership depend upon a superiority in science and technology -- for economic development or national defense -- that is understood and accepted. The nations of the world, seeking a basis for their own future progress and security, continuously pass judgment upon our ability as a nation to make decisions, to concentrate effort, to manage vast and complex technological programs in our own interest. It is not too much to say that in many ways the viability of representative government and of the free enterprise system, in a period of revolutionary changes based on science and technology, is being tested in space.

Third, our national defense -- perhaps even our national survival -- demands that we act to insure that no hostile force

will be permitted to use space as an unchallenged avenue of aggression against us.

The fourth and most important of the major reasons for undertaking a broad national program of space research and development -- the one which promises the greatest rewards for mankind -- is the fact that the technological applications which will flow from it, will offer vast returns on our space investment here on earth over many years ahead.

It should be made clear that our space mission is not limited to any single objective, such as manned exploration of the moon. While lunar exploration is a major focal point of our space effort, our true objective is overall pre-eminence in all aspects of space research and development.

We are developing, in short, the ability to operate in space as we have learned to operate on the land, on and under the sea, and in the air, and to use that ability for whatever purpose the national interest may require.

The rocket engine has enabled us to discard such ancient maxims as "what goes up must come down," and "the sky is the limit," and we are using it in many ways to give us the space power which we seek.

For our program in the space sciences we use more than a

hundred sounding rockets a year to speed outward from the earth, take measurements near the earth and out to a distance of one earth radius, and fall backward to the earth's surface.

For measurements over longer periods of time and outward to greater distances, we use larger rockets to send out satellites carrying a wide variety of scientific instruments which orbit the earth, some in circular orbits at a few hundred miles, some in elliptical orbits that reach outward several hundred thousand miles. These scientific satellites pass time and again through the various regions of space surrounding the earth, taking continuous measurements and monitoring such phenomena as the radiation in the Van Allen belts, which is caught by the earth's magnetic fields and held in these regions surrounding the earth.

You are probably familiar with some of these scientific satellites such as our own Orbiting Solar Observatory, and the two international satellites, Ariel and Alouette, which were launched as cooperative ventures with Great Britain and Canada.

To explore space beyond the reach of satellites, we use deep space probes like Mariner II which we sent within 22,000 miles of the planet Venus to measure important features of the planet, and transmit great quantities of data back to earth

across 36,000,000 miles of space. Among the many things gained from this flight, was the knowledge that Venusian surface temperatures of about 800 degrees will not sustain life as we know it, but that cooler conditions in the upper atmosphere might sustain some form of living organism.

Probes such as Mariner II permit the taking of measurements far out from the earth and correlate these with related measurements on the surface of the earth. The ability to measure energy streaming from the sun out millions of miles from the earth then again just above the earth's atmosphere and again as it reaches the surface of the earth, is expanding our knowledge in many areas related to the earth's atmosphere and weather.

In addition to the data obtained, the flight of Mariner II gave us important experience. The successful use of the highly-complicated mid-course correction maneuver, and the very long-range tracking and transmission of data -- which lasted until January 4 when Mariner was about 54,000,000 miles from the earth -- will help to insure the success of future missions.

Even larger spacecraft are required for manned exploration of space. Learning from the Mercury spacecraft which first circled the earth under automatic control and then again carrying Enos, the chimpanzee, and then under the control of man

as John Glenn circled the earth, we now have designed and are building in St. Louis the two-man Gemini spacecraft. This will give us experience with the weightless condition and other factors in space for a week or more. And beyond this, the three-man Apollo spacecraft, which we have under contract, will have a capability to orbit the earth for a month or two and later will serve as the basic mother craft for manned landing and exploration of the moon.

Parallel with the use of these four tools, sounding rockets, scientific satellites, deep space probes, and manned spacecraft goes the development of those specialized work-oriented spacecraft which perform useful functions. The Tiros weather satellite has been launched successfully six times and has vastly expanded our understanding of the weather and of the amount of energy absorbed by the earth and re-radiated by the earth -- knowledge essential to improvements in our capability for understanding the weather and using it more effectively.

The experimental communications satellites, Telstar and Relay, have proved the usefulness of satellite relay stations in space and have begun to lay a foundation on which the ability of man to communicate by telephone, other types of

messages, and by television can be vastly expanded. The world's international communications network bids fair to undergo a revolutionary period of progress as a result of our new knowledge about how to use satellites.

Parallel with our present activities in space exploration we have been laying the basis for more advanced efforts through development of the very large boosters and the complex engineering facilities on the ground which will be needed to build, test, and launch them.

The first stage of the Saturn rocket -- the largest known to exist in the world -- has already undergone three successful flight tests, and development is going forward on the Saturn V, the even more powerful rocket with 7 million 5 hundred thousand pounds of thrust which will be used to send American explorers to the moon.

Meanwhile, we are building, largely under the supervision of the Corps of Engineers, the very large test stands for the tremendous engines and the very large clusters of these engines which are required for our biggest boosters. The launching complex at Cape Canaveral must include an ability to assemble the large boosters, placing one stage on top of the other until the rocket stands, in the case of the Advanced

Saturn, almost as tall as the Waldorf-Astoria Hotel in New York.

The assembly building in which the Advanced Saturn will be assembled in a vertical position has been called the "tallest one-story building in the world." It will rise 525 feet above the ground, with a door about 46 stories high, and its cubic footage will be about that of the Empire State Building.

All of these activities and additional ones will undertake in the future, form the basis for a continuing, driving United States effort to achieve "pre-eminence in space," for whatever purpose the national interest may require.

Along with the other research and development activities which are underway, they will have profound social, political and economic effects, some of which are already apparent, and others which cannot yet be foreseen. The increasing movement of population from rural to urban areas is already apparent, but accompanying this -- in fact, causing it -- are significant changes in the nature of employment opportunities in this country. These changes relate directly to the educational base which future citizens will require if they are to contribute effectively to the economy and thus enjoy useful and prosperous lives.

I read, the other day, the statement that within the next generation 60,000,000 jobs will change in character, and that those who are now six years of age -- and about to enter elementary school -- can expect to change their vocations three times during the span of life. The author of these predictions concluded:

"One shot of formal education may have sufficed for most of us, but our children will need some form of education all during life."

I cannot verify the accuracy of these predictions, but certainly they reflect the changing character of our civilization. We have emerged into an era in which the educated, innovative, creative mind is increasingly becoming the dominant force in all progress in virtually every area of national activity.

We must look to the American educational system, beginning with our elementary schools and continuing on through undergraduate and graduate education to provide the creative intelligence which is our greatest national resource.

I am envious of your opportunity to prepare some of your students for careers in science and engineering, and to give all of them -- regardless of the field of activity they may

ultimately pursue -- an understanding of the growing role of science and technology in our lives.

The interest and the depth of understanding which the nation's young people have in scientific and technological programs -- activities which their parents find almost impossibly complex -- is apparent to all of us at NASA. It is inspiring to talk to children and read their letters, and to note their enthusiasm for and pride in the accomplishments which have been made in space. Let me share with you one example of this, which is typical of thousands of others.

Shortly after John Glenn's flight in February of last year, an elementary school teacher in a Philadelphia suburb asked her fifth-graders, who had been discussing myths, to compose some myths of their own. Here is what one of them wrote:

"About five years ago, Premier Khrushchev sent two men to the moon. He gave them a sign to put there so the rest of the world would know that Russia was there first. When the two Russians landed on the moon, they spoke to Khrushchev by radio. He asked them what they saw on the moon. They said they saw nothing but white mountains and a little sign.

"They said it read 'Two Million Miles to Cape Canaveral.'"

This example, I think, illustrates a pride of country which you, as educators, can nurture, and there is little doubt the space program can help you do it. Certainly, space activity has given boys and girls throughout the land new heroes and a dramatic new frontier with which to identify.

This identification with a useful and productive effort is something which will benefit our children and our country, particularly if youthful admiration can be related not only to a group of skilled and daring astronauts, but also to the team of highly trained and educated technicians, scientists, and engineers of which they are a part.

Because an appreciation of science and technology is important not only to the NASA program but to the nation, the space agency has developed a small, but active, educational services program designed to assist schools, colleges, and the public to meet the needs for education in the Space Age. The professional educators in our Office of Educational Programs and Services work closely with organizations such as yours, with many of the National Education Affiliates, with the U. S. Office of Education, the National Science Foundation, and other national organizations having a responsibility in education.

We use our unique scientific and technical "in-house" sources of space information to develop materials for books, booklets, pamphlets and other educational publications, in cooperation with practicing educator groups. We are making publicly available in useful form much of the motion picture footage of our rocket launches, scientific satellites, and other activities. NASA is the sole source for much of this type of information, and we are working dilligently to make it available to classroom teachers, students, and adult groups.

We are assisting colleges and universities in organizing and conducting workshops designed to provide teachers at all levels with better understanding of space science and technology, and of the implications of our drive into space -- social, economic, and political.

One of our most successful educational service undertakings has been the Spacemobile Program. This is a specially designed traveling space science demonstration unit which provides the school audience with accurate, up-to-date information on space science and exploration. A typical demonstration is about 50 minutes long and answers six basic questions: What is a satellite? How does it get into orbit?

What keeps it in orbit? What does it do? What good is it? And what are the plans for future research and exploration by NASA?

In the area of educational space exhibits we provide units ranging from single panels to collections of full-scale models with supporting panels to provide the public with comprehensible information about our space program.

Space presentations are given on educational TV channels and on the regular commercial networks, and NASA is now producing a series of programs in space science and technology for the national educational television network. We are also assisting the airborne television experiment and will continue to seek out ways in which we can help to enrich the teaching of science.

NASA provides assistance to sponsors of educational research projects in the elementary, secondary, and college areas. Supplementary instructional materials and teacher guides are about to be published, and we hope that some will be ready for curriculum workshops in the 1963 Summer Sessions.

As science and technology become increasingly dominant forces in our national life, every segment of society needs to reexamine its activities in the light of the changes which are occurring or can be anticipated in the future.

In the field of education it is evident that a first and obvious demand of this age is an increased supply of scientific and technical manpower, including scientists, mathematicians, and engineers with advanced degrees. This demand also includes the technicians, the craftsmen, whose skills are required for the implementation of scientific thought. One of the facts of the age, is a more intimate relationship between science and engineering, in which the engineer uses what the scientist has learned of the space environment to design equipment which will operate in that environment so that the scientist can learn even more.

A second obvious demand on education is the development of a citizenry with a higher level of scientific literacy, not merely to motivate more young people toward careers in science, but to assure our nation of a body politic better qualified to understand and cope with the problems of government and society during a period of great and rapid change.

And, finally, achievement of our goals in space will demand the highest scholastic efforts and intellectual accomplishments in virtually every field of study.

Space is, indeed, a new and challenging frontier, but it is a frontier of the intellect -- one which challenges brain, not brawn, with creative intelligence our greatest weapon.

Your elementary schools have a vital role as mankind moves toward the conquest of space.

#